Sawmill

A **Wood Magic Forest Fair** learning station for 4th graders

2023 edition (new science standards highlighted in yellow)

Objective

Students will be able to describe the process by which a log becomes a board and will be able to name several other solid products in addition to lumber.

Overview

Students watch as a log is cut into boards on a sawmill and learn how finished lumber is made. They also learn how sawdust and bark are used for fuel and for the manufacture of other products. They are introduced to particleboard, plywood, and oriented strand board (OSB).

2021 SC Science Standards

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function together in a system to support survival, growth, behavior, and reproduction.
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and how their uses affect the environment.

Materials List

Wood-Mizer LT15 portable sawmill
3-6 cedar logs (depends on diameter) for the week
PPE for sawyer
Safety glasses for all students
4-5 Rice Krispy Treats *per class*
Roll of paper towels – to illustrate plywood
12" X 12" pieces of OSB, particleboard, and plywood (labeled)
3 plys of plywood *per class (only break 1 per class)*
1-gallon Ziplock bags of wood chips, wood shavings, and bark chips
Dimensional lumber poster
Vocabulary signs – SOLID WOOD PRODUCTS, LUMBER, SAWYER, PARTICLEBOARD, OSB, PLYWOOD

Step-by-Step Procedures

1. Ask class, "Which station did you just come from? Who can tell me one thing you have learned today?" Relate what they have just seen to what they are about to see:
   Ex.: *Makin' Paper* – "Guess where some of the wood chips that are made into paper come from? Sawmills ship truckloads of chips every day to paper mills so that nothing is wasted."

2. Say, "If you listen real closely you might win a prize!" Ask, "Who can tell me some products that are made from trees?" They will probably mention paper, boards, toothpicks, desks; maybe even chewing gum or perfume. "At this station we are going to show you one way trees are made into SOLID WOOD PRODUCTS [hold up word sign] like LUMBER [hold up word sign] and engineered wood products. The solid wood part of a tree is made up mostly of the trunk. What's the job of a tree's trunk? **Interact with students.** The trunk provides support for branches, which in turn support the tree's leaves. The trunk and branches contain the tree's "plumbing"—the tubes that transport water and nutrients to the leaves and sugar from the leaves to the rest of the tree. They also contain the growing layer of the tree that makes the trunk, branches, and roots of the tree thicker each year.

3. "People have been cutting trees in America for a long time. What was one of the first things the early settlers do when they came to America and wanted to build their log houses?" *[cut trees]* "They also cut trees and cleared the forest so they could grow corn and other crops in fields. Who can tell me how else they used the trees that they cut?" *[firewood, pens for animals, handles for tools]*

4. "Today, we not only cut trees down, but also plant them back. At the 'Good Fire, Bad Fire' station you will learn/have learned that foresters sometimes make prescriptions for the forest. They might prescribe fire if there is a lot of underbrush that needs to be cleared out. They sometimes plant new trees in areas where there are not enough. They also might write a prescription that says to cut some of the trees if they are young and too thick or cut all of the trees if they are getting old and it's time to start a new forest. Foresters will usually put paint marks on the trees that need to be cut."
    a. "Loggers with chainsaws and big machinery, like the equipment you saw/will see at your popcorn break, look for the marks on the trees and will cut only the trees that the forester has marked. They have to be very careful when cutting the trees down. Can anyone tell us why they have to be careful?" [Answers may include: to keep from getting hurt, to keep from hurting others, to keep from damaging other trees, etc.] Show felled tree if available. Our loggers take safety first and are careful to protect the land, water, and wildlife when they are harvesting trees from the forest.

5. Describe felling, skidding, delimbing, bucking process. Tell how the wood is transported to the sawmill. Point to the log truck if it is within view and say, "Raise your hand if you would like to drive a big truck like that one day. There are a lot of jobs in forestry, so maybe some of you will be foresters, loggers, sawmill workers, or biologists one day and you will work in the forest, too!"

6. Describe how logs are normally (but not today**)** debarked before being sawn. Show students bag of bark. "Who can tell me one use they have seen for bark after it is taken off the tree?" [*bark mulch around shrubbery*] "I bet you didn't know that some mills have their own power stations that can burn bark to make their own electricity or produce heat to dry the wood after it's been cut! So, nothing from the tree is wasted after it is cut!"

7. Ask students what shape are trees? [*cylinders*]. Show students a precut board and ask what shape it is. [*rectangular prism*]. "How do you think we get rectangular boards from a round log?" Show **dimensional lumber sign** and discuss the different cuts a sawmill can make to get the most boards out of a log. "Now, we're going to see how a log is cut into boards. First, the logs are loaded onto a *carriage*, but this doesn't look like what you think of when you hear the word "carriage", does it? This carriage moves the log toward the bandsaw, which cuts the round log into flat boards. Who can guess what happens to the *sawdust* that piles up under the saw blade?" [*sent to paper mill or burned to make electricity*]

8. "The guy running the sawmill is called the SAWYER [hold up word sign]. Let's wave to him and see if he smiles! He decides how thick to cut each board and how to get the most lumber from each log. Modern sawmills even use lasers to scan each log and computers to figure out what size boards to cut so that the entire tree is used."

9. "Before the sawyer starts up the engine, let me give you some safety tips. Notice the sawyer is wearing his personal protective equipment or PPE. [helmet, safety glasses, gloves, chainsaw chaps]. We need you to stay back behind the _____(flagging, rope, etc.) so that we don't get any sawdust in our eyes."

10. "OK, Mr. Sawyer, show us how you turn a log into boards!" Sawyer will cut a board. Bring the board over to the students and let them smell it, but NOT touch it. Emphasis that you don't want anyone to get

a splinter. “This smells good, doesn’t it? This wood is called *redcedar* and has a strong smell because of its sap. Your parents or grandparents may have a cedar chest that they keep blankets or clothing in, because cedar wood has a natural insect repellant. This board is what we call *rough cut lumber* because you can see the saw blade cuts on the sides. We can also run it through a *planer* to smooth the sides. The planer works kind of like sandpaper. Have any of you used sandpaper before to make something smooth?”

11. “What do you see on the ground under the saw? [*sawdust* or *shavings*] That’s right, the saw makes a lot of sawdust when it cuts through the wood – kind of like when your dog eats his food – he’s kind of messy, isn’t he? Well, do you remember what we said the sawyer does with the sawdust? [*is sent to paper mill or burned to make electricity*] There is one other thing that can be done with the sawdust. It can be glued together to make a special kind of board called *particleboard*. Can you say that word with me – PARTICLEBOARD [hold up word sign]. When I think of particleboard I sometimes get hungry, because particleboard reminds me of a Rice Krispy Treat! Raise your hand if you like Rice Krispy Treats! I do, too, and you know, particleboard is kind of like Rice Krispy Treats. It’s made out of small pieces of wood or sawdust (that’s like the Rice Krispies) glued together, except Rice Krispy Treats are “glued” together with marshmallows because marshmallows taste better than glue!”

12. “Do you see all of those slabs of wood laying over there? What do you think is done with them? [*burned for electricity or sent to paper mill*] Yes, sometimes they are used just like sawdust or bark, but sometimes they are made into a especially strong board called ORIENTED STRAND BOARD [hold up word sign], or OSB for short. Instead of just gluing the parts together any old way like they do in particleboard, in OSB they turn the small pieces of wood in different ways and layer them together. This makes the board very strong.

13. “One other engineered wood product we want to talk about today is called PLYWOOD [hold up word sign]. Plywood is made by peeling a log on a special machine that kind of looks like they are unrolling the wood off the tree like you unroll a roll of paper towels [illustrate by partially unrolling a roll of paper towels]. These thin strips are then glued together to make a board that is a lot stronger than the individual strips. It looks kind of like this grilled cheese sandwich, doesn’t it? Now, we’re going to do an experiment to show just how strong this plywood is.” Have a student volunteer to come up and break a single ply of wood. They should be able to do it easily. Then ask, “Who do you think is the strongest person in your class? Who do you think could break a piece of plywood?” Take 3 plys of wood and show the students how each layer is turned 90 degrees from the one above and below it to make it stronger. Have the “strongest” student attempt to break the plywood. [Be careful of pinched fingers.] “That was pretty tough right??”

14. “OK, now it’s time to see how much you’ve learned here at the sawmill! Raise your hand if you know the answer to these questions and if you’re the first one to answer correctly you’ll win a Rice Krispy Treat! *(Please call on students who have not already volunteered and have a quiet hand raised.)*
    a. What do you call the guy that operates the sawmill? [*sawyer*]
    b. What is the sawdust and leftover scraps used for after the board is cut? [*burned for electricity or sent to paper mill*]
    c. What do you call the boards that have layers in them like a sandwich? [*plywood*[
    d. What is OSB made out of? [*small shreds of wood glued together*]
    e. What is the type of board that has sawdust glued together and looks like a Rice Krispie Treat? [*particleboard*]

Wrap-Up

"Today you've seen a real, live sawmill cut a log into boards. We've talked about how the rough lumber is made into smooth boards using the planer and edger. And you've learned how at the sawmill nothing is wasted; even the sawdust is used to make electricity or is sent to the paper mill to be made into paper. By not wasting anything, we are not adding to landfills which conserves the natural resource of land."

"You've also discovered that some trees are peeled like a roll of paper towels and then the thin pieces of wood are glued together to make a strong board called plywood. We've also taken a look at oriented strand board and particleboard, which are ways lumber people can make boards out of small pieces of scrap wood."

"So, foresters take good care of the forests and make sure they are healthy and the trees grow big. Forests provide homes for the wildlife, give us places to play, and provide us with a lot of other "gifts." Then when it's time to thin some of the trees out of the forest or cut all of the trees and start a new forest, sawmill people make sure that nothing in the tree is wasted. And, we know that it's OK to cut trees as long as we do what?" [*plant some back*]